What is claimed is:

1. A ferroelectric capacitor comprising:

a pair of electrodes; and

at least one ferroelectric held between the pair of electrodes, wherein the at least one ferroelectric comprises:

a first ferroelectric layer having a surface roughness (RMS) determined with an atomic force microscope of 10 nm or more; and

a second ferroelectric layer being arranged adjacent to the first ferroelectric layer and having a surface roughness (RMS) determined with an atomic force microscope of 5 nm or less.

2. A ferroelectric capacitor according to Claim 1, wherein the second ferroelectric layer is so arranged as to fill depressions on the surface of the first ferroelectric layer.

3. A ferroelectric capacitor according to Claim 1, wherein the first ferroelectric layer is formed at a temperature equal to or higher than a crystallization temperature at which the first ferroelectric layer takes on a crystalline structure displaying ferroelectricity, and wherein the second ferroelectric layer is formed at a temperature lower than a crystallization temperature at which the second ferroelectric layer takes on a crystalline structure displaying ferroelectricity.

4. A ferroelectric capacitor according to Claim 1, wherein the first ferroelectric layer is formed at a temperature equal to or higher than 500°C, and wherein the second ferroelectric layer is formed at a temperature lower than 500°C.

5. A ferroelectric capacitor according to Claim 1, wherein the first ferroelectric layer has a perovskite crystal structure and wherein the second ferroelectric layer has a perovskite crystal structure converted from an amorphous structure.

6. A ferroelectric capacitor according to Claim 5, wherein the second ferroelectric layer has a perovskite crystal structure converted from an amorphous structure as a result of a thermal treatment.

7. A ferroelectric capacitor according to Claim 6, wherein the thermal treatment is one of reduced-pressure rapid thermal annealing (RTA) at a temperature higher than the film forming temperature of the first ferroelectric layer and normal-pressure rapid thermal annealing (RTA) at a temperature higher than the film forming temperature of the first ferroelectric layer.

8. A ferroelectric capacitor according to Claim 1, wherein the ferroelectric is at least one selected from the group consisting of

$Pb(Zr,Ti)O_3$ [PZT], $SrBi_2Ta_2O_9$ [SBT], and $Bi_4Ti_3O_{12}$ [BIT].

9. A ferroelectric capacitor according to Claim 1, wherein the first ferroelectric layer comprises $Pb(Zr,Ti)O_3$ [PZT] having a perovskite crystal structure and wherein the second ferroelectric layer comprises $Pb(Zr,Ti)O_3$ [PZT] having a perovskite crystal structure converted from an amorphous structure.

10. A ferroelectric capacitor according to Claim 1, wherein the second ferroelectric has a perovskite crystal structure, except with its A-site doped with at least one selected from the group consisting of La, Sr, Ba and Ca.

11. A ferroelectric capacitor according to Claim 1, wherein the second ferroelectric has a perovskite crystal structure, except with its B-site doped with at least one selected from the group consisting of Nb, Ta, W and Bi.

12. A ferroelectric capacitor according to Claim 1, wherein at least one of the pair of electrodes comprises at least one selected from the group consisting of IrO_2, RuO_2, $SrRuO_3$, and $La_{2-x}Sr_xCuO_4$, wherein x is more than 0 and is 1 or less.

13. A ferroelectric capacitor according to Claim 1, comprising one of the pair of electrodes, the first ferroelectric layer,

the second ferroelectric layer, and the other of the pair of electrodes in this order, wherein the first ferroelectric layer has columnar crystals, and wherein the second ferroelectric layer has granular crystals.

14. A semiconductor device comprising:

a substrate; and

a ferroelectric capacitor arranged above the substrate,

wherein the ferroelectric capacitor comprises:

a pair of electrodes; and

at least one ferroelectric held between the pair of electrodes,

wherein the at least one ferroelectric comprises:

a first ferroelectric layer having a surface roughness (RMS) determined with an atomic force microscope of 10 nm or more; and

a second ferroelectric layer being arranged adjacent to the first ferroelectric layer and having a surface roughness (RMS) determined with an atomic force microscope of 5 nm or less.

15. A process for producing a ferroelectric capacitor comprising a pair of electrodes and at least one ferroelectric held between the pair of electrodes, the process comprising the steps of:

forming a first ferroelectric layer above one of the pair of electrodes at a temperature equal to or higher than a crystallization temperature at which the first ferroelectric layer takes on a

crystalline structure displaying ferroelectricity; and

forming a second ferroelectric layer adjacent to the first ferroelectric layer at a temperature lower than a crystallization temperature at which the second ferroelectric layer takes on a crystalline structure displaying ferroelectricity.

16. A process according to Claim 15, wherein the first ferroelectric layer is formed at a temperature equal to or higher than 500°C, and wherein the second ferroelectric layer is formed at a temperature lower than 500°C.

17. A process according to Claim 15, further comprising:

forming the other one of the pair of electrodes on or above the formed second ferroelectric layer; and

subjecting the entire ferroelectric capacitor to a thermal treatment to thereby convert the second ferroelectric layer from an amorphous structure to a crystalline structure.

18. A process according to Claim 15, wherein the first and second ferroelectric layers are formed by at least one procedure selected from the group consisting of chemical solution deposition (CSD), metalorganic chemical vapor deposition (MOCVD), pulse laser deposition (PLD), sol-gel method, and sputtering.

19. A process according to Claim 15, wherein the first and

second ferroelectric layers are formed by metalorganic chemical vapor deposition (MOCVD), and wherein the first ferroelectric layer is formed at a temperature higher than a temperature at which the second ferroelectric layer is formed.

20. A process according to Claim 15, wherein the first ferroelectric layer is formed by metalorganic chemical vapor deposition (MOCVD), and wherein the second ferroelectric layer is formed by sputtering.